

Notice of Allowability

Application No.

09/943,765

Examiner

Robert B. Davis

Applicant(s)

WILLIAMS, VERNON M.

Art Unit

1722

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed 01/12/2004.
2. ☒ The allowed claim(s) is/are 3,7,12,15,16,18 and 20-24.
3. ☒ The drawings filed on 3/24/2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 12/15/2003
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 022004.
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Robert B. Davis
Primary Examiner
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EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Trent N. Butcher on 2/3/4.

The application has been amended as follows:

The specification and claims have been amended as shown on the attached pages.

The term "imperforate" has been deleted to overcome the new matter rejection. The phrase "a boundary wall that is sized and configured to substantially conformally receive a portion of one of a plurality of conductive structures" is fully supported by figure 7 and therefore not new matter. For these reasons the new matter rejection has been withdrawn. The examiner considers this statement to mean that the recesses prevent the resin from fully covering the conductive structure and as can be seen from figure 7, the recess must conform to the shape of the conductive structure. Applicant's arguments in the amendment of 1/12/2004 regarding the combination of Tsuji et al or Orcutt and Japanese reference 6-151492 are convincing in regard to the recesses substantially conforming to the shape of the conductive structures and the vertical orientation of the encapsulant restraining cavity formed between the first and second members. Therefore, the prior art rejections based on the combination of references

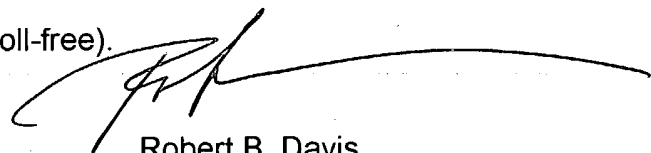
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have been withdrawn. The indefiniteness rejection has been withdrawn because of the amendment to claims 3, 7 and 12 in the non-entered amendment, which has been copied in the attached claims without the term "imperforate".

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert B. Davis whose telephone number is 571-272-1129. The examiner can normally be reached on Monday-Friday 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L. Walker can be reached on 571-272-1151. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Robert B. Davis
Primary Examiner
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Amendments to the Specification:

Paragraph [0031] has been replaced with the following paragraph, which is marked to show amendments:

[0031] A fourth embodiment of the present invention is illustrated in drawing FIG. 7, depicting resin 24 filling the cavity 10'' of a transfer mold 5'' in a substantially vertical direction to cover at least the second surface 55 of the substrate, in this case a flip-chip type semiconductor die 52. Of course, the cavity 10'' may alternatively be configured to hold and facilitate encapsulation of an individual semiconductor die 52, a plurality of individual dice, or a wafer or other large-scale substrate with a plurality of semiconductor devices thereon. The fourth embodiment is similar to the second embodiment in all respects, except the semiconductor die 52 includes conductive structures 56, such as balls, bumps, pillars, or columns including a conductive material such as a solder, other metal or metal alloy, a conductive epoxy, a conductor-filled epoxy, or a z-axis conductive elastomer, predisposed on and protruding from the bond pads thereof. Additionally, the second half 14'' of the transfer mold 5'' may include a plurality of recesses 58 formed in and configured to substantially conformally receive at least portions of conductive structures 56 so as to prevent resin 24 from completely covering the same.

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Amendments to the Claims:

Claims 3, 7, 12, 15, 16, 18, 20, and 21 have been amended as shown below.

Please note that all claims currently pending and under consideration in the referenced application are shown below. Please enter these claims as amended. This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claims 1-2 (Canceled)

3. (Currently amended) A transfer molding apparatus comprising: first and second members configured to be assembled with one another;

at least one encapsulant restraining cavity formed in at least one of saidthe first and second members, saidthe at least one cavity extending longitudinally in a non-horizontal orientation;

at least one gate at a lower portion of saidthe at least one cavity;

at least one vent at an upper portion of saidthe at least one cavity, and

wherein saidthe at least one cavity includes at least one surface with recesses formed therein, each of saidthe recesses having an imperforate boundary wall that is sized and configured to at least partially substantially conformally receive a portion of one of a plurality of conductive structures protruding from a substrate positionable in saidthe at least one cavity.

Claims 4-6 (Canceled)

7. (Currently amended) A transfer molding apparatus comprising:

first and second members to be assembled with one another;

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at least one encapsulant restraining cavity formed in at least one of said the first and second members, said the at least one cavity extending longitudinally in a substantially vertical orientation;

at least one gate at a lower portion of said the at least one cavity;

at least one vent at an upper portion of said the at least one cavity, and

wherein said the at least one cavity includes at least one surface with recesses formed therein, each of said the recesses defined by an imperforate boundary wall that is sized and configured to substantially conformally receive a portion of one of a plurality of conductive structures protruding from a substrate positionable in said the at least one cavity.

Claims 8-11 (Canceled)

12. (Currently amended) A transfer molding apparatus for molding a substrate in a substantially vertical orientation, the apparatus comprising:

a first member and a second member configured to be assembled with one another, each of said the first member and said the second member having an inside surface and an outside surface;

multiple encapsulant restraining cavities each formed in said the inside surface of at least one of said the first member and said the second member, each of said the multiple cavities sized and configured for the substrate to be disposed therein, said the multiple cavities extending longitudinally in a non-horizontal orientation; at least one gate formed in any one of said the first member and said the second member extending from a lower portion of each of said the multiple cavities; at least one vent formed in any

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one of said the first member and said the second member extending from an upper portion of each of said the multiple cavities; and

wherein at least one of said the multiple cavities includes recesses formed in said the inside surface on said the at least one of said the first member and said the second member, each of said the recesses defined by an imperforate boundary wall that is sized and configured to substantially conformally at least partially receive a portion of one of a plurality of conductive structures protruding from the substrate positionable in said the at least one of said the multiple cavities.

Claims 13-14 (Cancelled)

15. (Currently amended) The transfer molding apparatus of claim 12, wherein said the multiple cavities are configured and longitudinally oriented to provide a substantially vertical flow for encapsulation of the substrate positionable in said the multiple cavities.

16. (Currently amended) The apparatus according to claim 3, wherein said the at least one cavity comprises a substantially vertically oriented cavity.

Claim 17 (Cancelled)

18. (Currently amended) The apparatus according to claim 7, wherein said the at least one cavity is configured to provide a substantially vertical flow for encapsulation of a substrate positionable in said the at least one cavity.

Claim 19 (Cancelled)

20. (Currently amended) The transfer molding apparatus of claim 12, wherein each of said the multiple cavities comprises a substantially vertically oriented cavity.

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21. (Currently amended) The transfer molding apparatus of claim 12, wherein each of said the multiple cavities includes a longitudinal length substantially oriented along a substantially vertical orientation.

22. (Previously presented) The transfer molding apparatus of claim 3, wherein the plurality of conductive structures comprise pillars or columns.

23. (Previously presented) The transfer molding apparatus of claim 7, wherein the plurality of conductive structures comprise pillars or columns.

24. (Previously presented) The transfer molding apparatus of claim 12, wherein the plurality of conductive structures comprise pillars or columns.

Claims 25-27 (Cancelled)